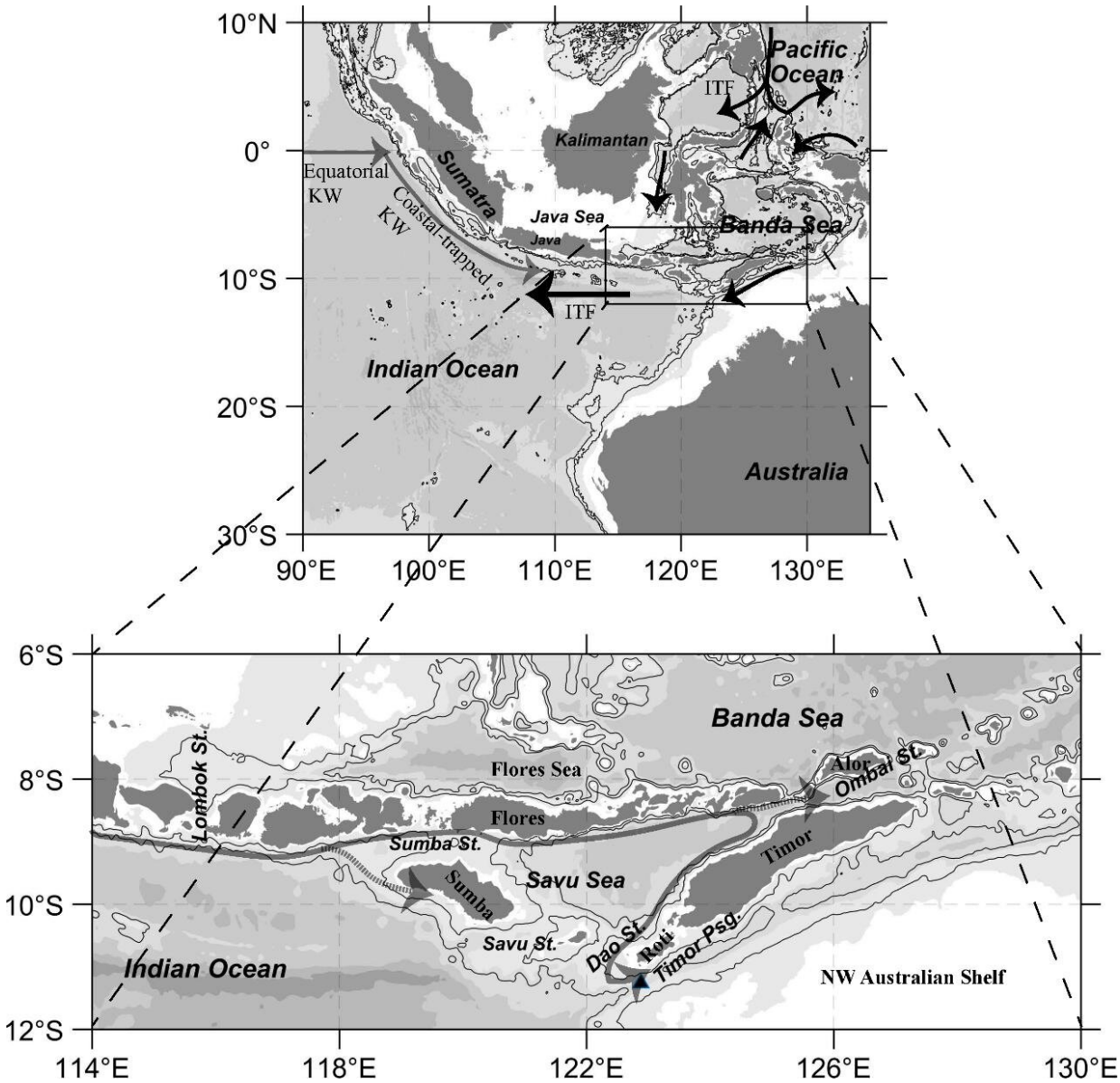
# Observing Indonesian Throughflow transports of Timor Passage during strong Indian Ocean Dipole

November 18 2022, by Li Yuan



Bathymetry in the Indonesian seas and the mooring (triangle) position deployed in the Timor Passage. Equatorial and coastal-trapped Kelvin waves in the eastern Indian Ocean are marked, and schematics of the ITF in the Western Pacific Ocean and Indonesian seas are also shown with arrows. Credit: IOCAS

The transport through the Timor Passage, a major strait east of Timor-Leste connecting the Indian Ocean with the Indonesian seas, contributes a large portion of the Indonesian Throughflow (ITF) transport.

However, the interannual variations of the Timor Passage currents during major interannual climate anomaly events, like El Nino Southern Oscillation (ENSO) and Indian Ocean Dipole, have not been observed.

Recently, scientists from the Institute of Oceanology of the Chinese Academy of Sciences (IOCAS) and Research Center for Oceanography-National Research and Innovation Agency (RCO-BRIN) in Indonesia have disclosed the transports of the Timor Passage during a strong Indian Ocean Dipole event.

Their study was published in *Journal of Geophysical Research: Oceans* on Nov. 11. It was based on the current meter data collected by a deep ocean mooring in the Timor Passage from September 2017 to December 2019, covering the strongest positive Indian Ocean Dipole event on record in 2019.

The mooring is part of the Western Pacific Ocean Circulation-ITF (WPOC-ITF) mooring array, constructed by IOCAS with the help of RCO-BRIN, to measure the ocean circulation and climate change in western Pacific and eastern Indian Oceans.

These data serve as an important complement to the international Nusantanggara Transport (INSTANT) program observation in 2003–2006.

The observations suggested that Indian Ocean dynamics won out over the Pacific Ocean dynamics in gating the transport through the Timor Passages during the 2019 Indian Ocean Dipole event. The mean volume transport through the Timor Passage into the Indian Ocean was newly estimated to be -9.9 ±1.0 Sv (1 Sv=$10^6$ $m^3$ $s^{-1}$) in the upper 1,400 m, with much of this transport concentrated in the upper 480 m (-8.9 Sv).

This value is in contrast to the -7.5 Sv above 1,890 m estimated based on INSTANT mooring measurements. The transport during the 2019 positive Indian Ocean Dipole event was only slightly larger than that during the 2018 normal year in the upper 480 m.

Seasonally, a dominant annual cycle in the upper 150 m driven by local monsoonal winds and a semiannual cycle in the lower layer driven by remote Kelvin waves from the Indian Ocean were observed.

The baroclinic processes, due to the strong stratification of the ocean, played an important role in producing the semiannual-dominant variability of the ITF through the Timor Passage.

"The annual cycle transports in the upper and lower layers largely cancel each other. The disclosed results are important for understanding the dynamics of the ITF connecting the Indian Ocean and the Indonesian seas," said Prof. Yuan Dongliang from IOCAS, the corresponding author of the study.

**More information:** Jing Wang et al, Moored Observations of the Timor Passage Currents in the Indonesian Seas, *Journal of Geophysical Research: Oceans* (2022). DOI: 10.1029/2022JC018694